

Application No. 09/594,816
Amendment filed June 3, 2004
Reply to final Office Action mailed April 4, 2004

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REMARKS

Claims 1-22 are pending, with claims 1, 5, and 7 being in independent form. By this Amendment, the specification is amended, claims 1, 5, and 7 are amended, and claims 20-22 are added.

The specification has been amended to expressly recite information from U.S. Patent No. 5,832,079 to Rabe, having a common Assignee to this application, that is incorporated by reference on page 2, lines 18-19 of the specification. Although the information incorporated by reference from a U.S. Patent or U.S. Patent Application Publication need not be expressly incorporated into the application, the Applicant has amended the specification to better aid those in understanding the invention. See MPEP § 608.01(p).

The passages expressly included from Rabe can be found at col. 1, l. 64 to col. 2, l. 3; col. 3, ll. 23-31 (reference numerals changed, accordingly); and col. 3, ll. 44-47 of the document. These passages describe the properties of an acoustic horn 26 much like the acoustic horn 27 described and claimed in this application. The amendment merely adds the actual text of the identified material incorporated by reference, modified only by changing the reference numbers for like elements shown in the figures. Accordingly, the Amendment is considered proper, as no new matter has been added. See MPEP § 2163.07(b).

In the final Action, claims 1-3, 5-11, and 13-15 are finally rejected for anticipation by U.S. Patent No. 6,134,336 to Clark. Claims 4 and 12 are finally rejected for obviousness over Clark. Also, claims 16-19 stand finally rejected for obviousness over Clark in view of U.S. Patent No. 6,381,126 to Yoshimoto et al. ("Yoshimoto"). The Applicant believes this Amendment overcomes the rejections raised in the final Action for the following reasons

Anticipation requires that every feature of the claimed invention be shown in a single prior document. In re Paulsen, 30 F.3d 1475 (Fed. Cir. 1994); In re Robertson, 169 F.3d 743 (Fed. Cir. 1999). The pending claims positively recite features that are not described in the cited document.

For example, claim 1 as amended recites, among other things, an acoustic horn having an acoustical impedance matched with impedances of an ear and the

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driver, . . . wherein the horn has a cross-sectional area that generally increases in one of an exponential, conical, parabolic, and hyperbolic manner from the small end to the large end. Support for the amendment can be found in the portions incorporated by reference on page 2, lines 18-19 of the specification and expressly added on pages 5 and 6 of the specification by this Amendment, as well as in FIGS. 2 and 3 depicting exemplary cross-sections of the acoustic horn 27.

Clark does not disclose an acoustic horn having the properties recited in amended claim 1. In particular, Clark's recess does not have a cross-sectional area that generally increases in one of an exponential, conical, parabolic, and hyperbolic manner from the smaller end of the recess 418, where the speaker diaphragm 402 and voice coil 404 are located, to the larger end of the recess 418 where the second housing portion 118 is located.

Instead, Clark discloses a recess 418 in a housing portion 116 of a portable electronic device. Clark's recess 418 does not possess the inherent structural properties of an "acoustic horn", as that term would be understood by those of ordinary skill in the acoustical arts, much less a exponentially, conically, parabolically, or hyperbolically increasing cross-sectional area from its smaller end to its larger end. The steps on the inner wall of the recess 418 that exist from the location of the speaker diaphragm 402 and voice coil 404 to the second housing portion 118 should be ample evidence of this.

In addition, Clark describes alternative embodiments in conjunction with FIGS. 6-8 that significantly alter the cross-sectional area of the recess 418. Yet, Clark describes that the "alternate assembly [of FIG. 6] may operate the same as that described in relation to FIG. 5, and have the same performance as that described in relation to FIGS. 11-12. Col. 7, ll. 5962. Clark further states that with the alternate arrangement of FIGS. 7 and 8, the "sound pressure waves travel substantially the same as those described in relation to FIG. 5, and similar results as described in relation to FIGS. 11-12 are achieved". Col. 8, ll. 29-32.

Persons skilled in the art would understand that if Clark's recess 418 were truly an "acoustic horn", altering the cross-sectional area in the manner described in conjunction with FIGS. 6-8 could not produce substantially the same performance

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as the arrangement shown in FIG. 5. Accordingly, claim 1 is believed not to be anticipated by Clark for at least these reasons.

Incorporating an acoustic horn with features defined in claim 1 into Clark's arrangement would not be obvious either, as there would be no motivation to make such an alteration to Clark's arrangement. While Clark describes similar challenges as those faced by the Applicant in the design of acoustic systems for portable electronic devices, Clark's arrangement addresses those challenges in a completely different manner than the arrangement defined by claim 1.

For example, Clark states that a need "exists for a speaker assembly for small handheld radiotelephones, which has limited space for enclosing the speaker and limited size for providing an airtight seal with the human ear, that provides acceptable audio-quality". Col. 3, ll. 9-13. In describing the function of the ported-arrangement shown in FIG. 5, Clark states that:

[s]ound pressure waves from the rear side of diaphragm 402 travel through the plurality of openings 424 (such as openings 426 and 428), through felt 412, and through the passages formed in housing portion 116. These sound pressure waves exit upper housing 102 through the plurality of openings 202 (such as openings 204 and 205) to the open air. With such an arrangement, portable radiotelephone 100 provides an acoustic frequency response that is substantially independent of a seal around ear placement region 114

Accordingly, Clark's ported-arrangement that allows sound pressure waves to exit the housing 102 through the openings 202 is central to the stated need addressed by the cited document.

In contrast, the Applicant defines an electroacoustic transducer arrangement in claim 1 that includes an acoustic horn and a driver, commonly referred to in the art as compression driver. Compression drivers are needed to produce sufficiently high sound pressure levels at the small (or throat) end of an acoustic horn to adequately driver the horn. Persons skilled in the art would understand that Clark's ported speaker arrangement, having a plurality of openings 202 that allow sound waves to escape, would not be capable of driving an acoustic horn, as the arrangement must generate even less sound pressure than a conventional non-ported speaker arrangement. Accordingly, claim 1 is believed not to be unobvious in

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view of the documents of record as well.

With respect to Independent claims 5 and 7, these claims have been amended to recite features that are substantially similar to the absent and unobvious features of claim 1 identified above. Accordingly, claims 5 and 7 are considered allowable for at least the same reasons as claim 1. The remaining claims, which ultimately depend from one of claims 1, 5, and 7, are considered allowable for at least these same reasons.

In addition to the above, claims 20-22 recite that "the acoustic horn is about 5 mm in length from the small end to the large end and is about 4 mm wide at the large end". None of the documents of record describe or suggest this feature. Support for the amendment can be found on page 6, lines 1-2 of the specification as originally filed prior to this Amendment. As described on page 3, lines 11-15, of the specification:

the Applicant's discovery that, in receivers, it may be appropriate to match impedance of a horn to impedance of the driver and impedance of a user's ear instead of matching impedance to impedance of free air. This discovery results in permitting substantially smaller impedance matched horns and drivers than were previously known.

Accordingly, claims 20-22 are considered to be allowable for these reasons as well.

Regarding claims 4 and 12, the Applicant disagrees with the Office's assertion that these are obvious in view of Clark. The Office admits that Clark does not explicitly describe that the membrane 402 has a diameter less than 1 mm.

Nevertheless, the Office contends that:

because the Applicant's specification describes no criticality for the specific claimed 1 mm driver membrane, it would have been obvious for one skilled in the art to use any speaker technology, including the 1 mm diameter membranes, in Clark, as long as the basic concept of providing an acoustic frequency response that is substantially efficient within the practice of the phone operation.

The Applicant respectfully disagrees.

First, the Applicant's statements that the driving membrane 37 can be on the order of 2 to 5 mm, etc., as desired or necessary should not be used in any way to diminish that the Applicant clearly describes that the driving membrane 37 can also be less than 1 mm. Among other things, the diameter of the driving membrane 37

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can affect the amount of sound pressure generated at the small end of the acoustic horn 27. As such, the diameter of the driving membrane 37 can depend on the cross-sectional area of the small end horn 27. Thus, depending on the size of the small end of the acoustic horn 27 employed, the diameter of the driver membrane 37 can be sized appropriately as described. These statements by the Applicant should not be used as a basis for asserting that a claim to a driving membrane having a diameter less than 1 mm is obvious. The Applicant is aware of no such statutory basis in the Patent Laws.

Moreover, persons skilled in the art would understand that the use of a speaker having a diaphragm 402 in the range of 1-5 mm in Clark's arrangement, much less a diaphragm less than 1 mm as claims 4 and 12 recite, could not produce sufficient sound pressure to produce any audible sound. This is especially true here, as the efficiency for a conventional speaker, much less Clark's ported arrangement having a plurality of openings 202 that allow sound waves to escape, is known to those skilled in the art to be many orders of magnitude lower than the efficiency of an acoustic horn. Accordingly, claims 4 and 12 are considered allowable for these reasons as well.

It is believed this application is now in condition for allowance. An early Notice to this effect is earnestly solicited. If the Examiner has any questions, he is invited to telephone the undersigned at the number given below.

Respectfully submitted,

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I hereby certify that this correspondence is being sent by facsimile transmission to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 to the following facsimile number:

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